

Two new cavernicolous taxa of the subgenus *Copromyza* (*Crumomyia*) (Diptera, Sphaeroceridae)

by

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With 14 figures

ABSTRACT

Two new subspecies, *Copromyza* (*Crumomyia*) *glacialis gallica* ssp. n. and *C. (Crumomyia) parentela cavernicola* ssp. n. are described, which are not closely related but collected in the same cave (grotte de St. Vincent, Haute-Provence, France); also short discussions are provided to explain taxonomical relationships and presumable evolution of the two new taxa.

INTRODUCTION

In the last two decades very rich and highly interesting materials of cave-dwelling Diptera were collected by the staff and co-workers of the Geneva Museum. The senior author had identified a significant part of these dipterous materials and his work was resulted in two papers (PAPP 1978, 1982). In the course of the second part of identification work some specimens of the sphaerocerid subgenus *Copromyza* (*Crumomyia*) were found which seemed to belong to new taxa and which are not closely related though they were found in the same cave. These taxa were not involved in the paper on cavernicolous flies of the Geneva Museum (c.f. PAPP 1982: 10) and their description was much delayed for better understanding of their taxonomical position and evolutionary relationship. The collector of those comparatively large black flies, Mr John D. Bourne was kind

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enough to give us important details on the St. Vincent Cave (letter communication), where our flies were found. The authors are very grateful to Mr. Bourne for the description below.

«Grotte de St. Vincent, Mélan, Alpes de Haute Provence, France, alt. 1520 m. The cave is situated in an isolated outcrop of Liassic Limestone in a region extremely poor in karstic phenomena. Topographically the cave is very simple, consisting of a very large room (about 30 m diameter) with a few small lateral passages and a terminal shaft. The cave slopes downwards from the entrance and is therefore always cool even during the very hot summer months. The outside environment is hot and dry in the summer and snow covered in the winter. Among the interesting species captured in this cave the following are worthwhile noting: Palpigrada — *Eukoenenia spelaea spelaea* (Peyerimhoff), Diplopoda — *Broelemannuema plamatum* (Bröl), Diplura — *Plusiocampa magdaleni* Condé. The last two species only known from this cave and another one about 80 km further south.»

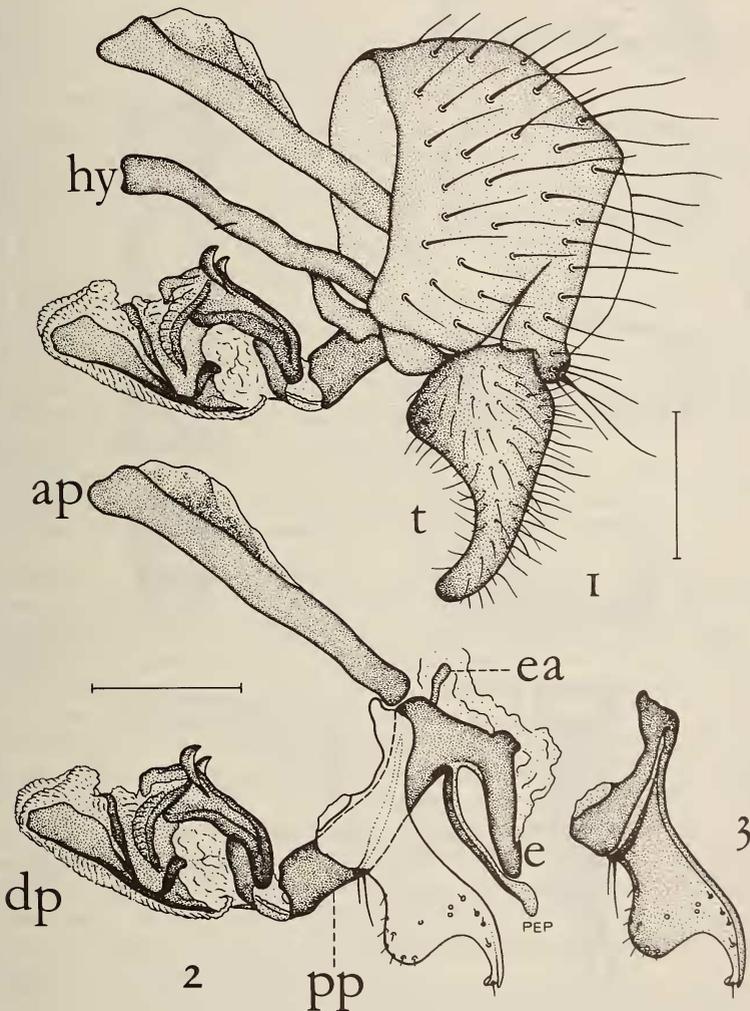
This comparatively severe isolation of the St. Vincent Cave is an important item in our discussion of these problematic flies. Namely, both new forms seem to represent a troglobite (obligatory cavernicolous) species judging by their outer morphological features: both forms have eyes much reduced, slender and elongated legs, their wings are reduced and volume of thorax is much reduced, i.e. they are unable to fly. Within the subgenus *Copromyza* (*Crumomyia*) they are not closely related and we managed to find their closest relative each among the known species of *Crumomyia*. In accordance with some important principles on troglobite species published by HOWARTH (1980) and considering of the possible distribution of the true cavernicolous flies in Europe (Papp 1982: 9-10), we think that both forms originate from a species each, which had a wide distribution during Pleistocene and which was stenoec as regards humidity and preference of low temperature. Small population of both species was "trapped" in the St. Vincent Cave and evolved to be a cavernicolous population. Those are why we consider both forms as distinct subspecies, though both have closely related population on other parts of Europe (see below). We are convinced that a more systematical collecting of the species of *Crumomyia* (incl. *Speomyia*) and a thorough examination of their physiology and biochemical features (isozymes) through their culturing are full of promise; also as regards better knowledge of cavernicolous arthropods of Europe.

Copromyza (*Crumomyia*) *glacialis gallica* ssp. n. (Figs. 1-3, 4-6, 7-8)

Measurements in mm: body length 5.91 (holotype male), 6.23 (paratype female, postabdomen excl.); wings 4.14×1.60 (holotype), 4.23×1.63 (paratype); length of thorax 1.71 (holotype) and 1.66; width of abdomen 1.66 (holotype); length of hind femur 2.49 (holotype), 2.34; length of hind tarsomeres 1-5: 1.83 (holotype), 1.86; length of hind tibia 2.11 (holotype), 2.06; length of arista 1.74 (holotype). All measurements made on specimens in alcohol.

Body and legs shining black, wings yellowish, veins brown, costal vein and basal part of r_5 , m and cu veins darker brown; a diffuse spot around anterior crossvein, also hind crossvein with a small dark spot or at least t_1 darker than other parts of veins. Height of head equal with length of head and namely 0.71 mm, smallest genal width 0.33 mm, length of eye 0.45 mm, width of eye 0.34 mm (holotype), i.e. eyes much reduced. Arista with sparse hairs of 0.045-0.055 mm. Middle femur of male ventrally with very long dense white hairs (0.23 mm), ventral side of middle tibia with similar hairs even longer (0.31 mm). Fore and hind metatarsi with a curved hook ventroapically; a thin antero-

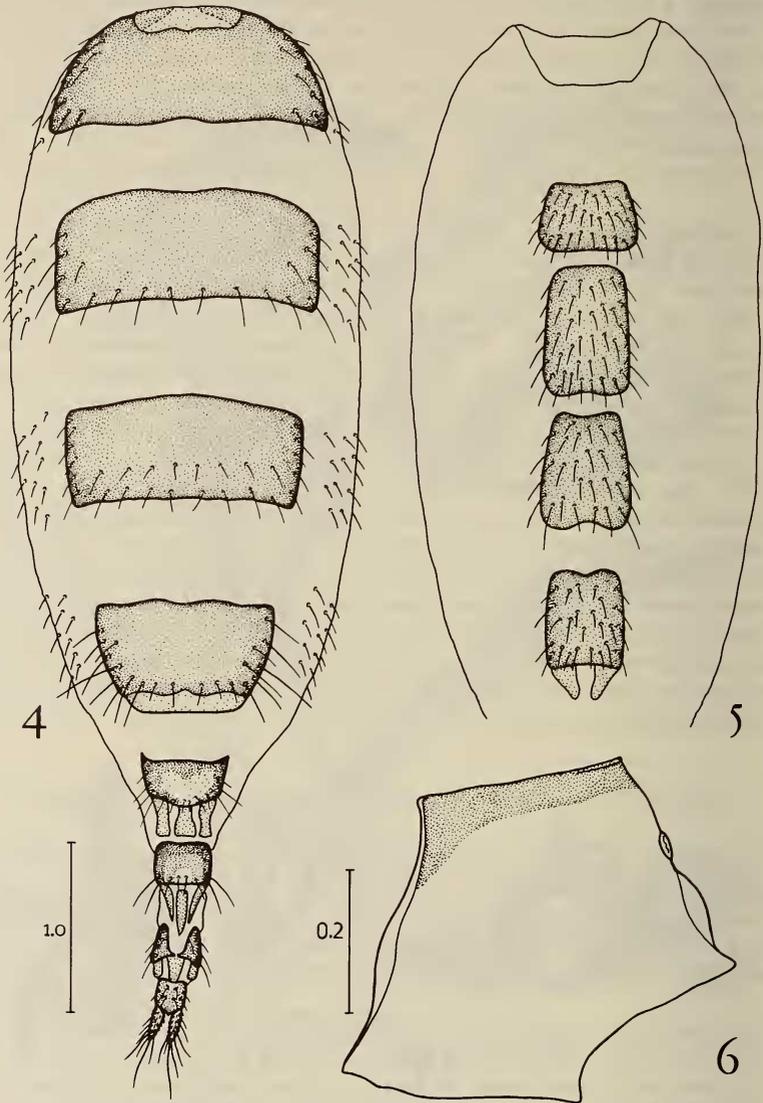
ventral at distal 0.64 of hind tibia, hind metatarsus 0.40 mm long. t_a-t_p 1.27 mm, distal section of vein m 1.07 mm, posterior crossvein 0.33 mm (holotype), these sections 1.34 mm, 1.03 mm and 0.34 mm in paratype female. Discal cell without a vein-appendage (holotype male) or with a very short (0.05-0.06 mm) appendage. The specimens are in a very poor state of preservation; the holotype is without left middle tibia and tarsi and right fore leg, the paratype female is without spermathecae and also right tarso-meres 2-5 lost.



FIGS. 1-3.

Copromyza (Crumomyia) glacialis gallica ssp. n., holotype male. 1: genitalia laterally; 2: aedeagal complex laterally (right postgonite omitted); 3: postgonite. Abbreviations: ap: aedeagal apodeme, dp: distiphallus, e: epiphallus; ea: ejaculatory apodeme, hy: hypandrium, pep: pre-epiphallus, pp: phallosophore, t: telomere. Scales = 0.2 mm.

Male genitalia highly characteristic. Periandrium densely and long but finely haired, lateral slot shorter than in *parentela cavernicola*. Hypandrium robust, Y-shaped in dorsal view, with long robust lateral arms. Telomere of distinctive shape (Fig. 1), ex-



FIGS. 4-6.

Copromyza (Crumomyia) glacialis gallica ssp. n., paratype female. 4: abdomen dorsally; 5: preabdominal sterna ventrally; 6: mesopleuron (pruinose area dotted). Scales: Figs. 4-5: 1.0 mm, Fig. 6: 0.2 mm.

tremely convex in proximal half and strongly tapered (almost digitiform) distally, its outer surface covered by fine hairs being longer posteriorly. Aedeagal complex (Fig. 2) structurally resembling that of the *C. glacialis*-group (sensu Roháček, 1976). It has long but comparatively straight phallosophore, robust epiphallus with basal tubercle-shaped projection and a slender pre-epiphallus arising close to basis of epiphallus. Distiphallus relatively voluminous (more than in any species of *C. glacialis*-group) and bearing a pair of small dorsal hooks. Postgonite (Fig. 3) most similar to that of *C. parentela alpicola* and *C. p. cavernicola* (and of course to that of *C. glacialis*) but particularly its middle part essentially different and much more slender. Ejaculatory apodeme present, partly hidden in the posterior aperture of phallosophore.

Female preabdomen (Figs 4-5) with rather small terga but the abdomen much extended owing to gravidity of paratype female. Preabdominal sterna small and narrow, sterna 3-5 are distinctly longer than wide, all densely and finely setulose. Female postabdomen (Figs 7-8) with all terga much narrower than those of preabdomen, postabdominal sterna, contrarily, only slightly narrower than preabdominal ones. Tergum 6 rather wide and transverse with dark colour only on lateral and anterior margins. Tergum 7 with similar pigmentation but more narrower and less transverse. Posteriorly to terga 6-8 and sterna 5-7 (!) there are secondary tergal-shaped sclerotizations of the intersegmental membranes (two behind sternum 5 and 7 each, three behind other sclerites). Tergum 8 shaped characteristically, bipartite, deeply emarginate anteriorly. Tergum 9 subquadrate not elongate with pale pigmented basal spot and shorter setulae on disc. Sterna 6 and 7 also with U-shaped pigmentation. Sternum 8 completely divided into 2 sclerites, each bearing some fine hairs. Tergum 9 elongate rather pale pigmented. Cerci (Figs 7-8) not very slender with numerous fine hairs, some of these sinuate (particularly the longest one). Spermathecae not studied (lost).

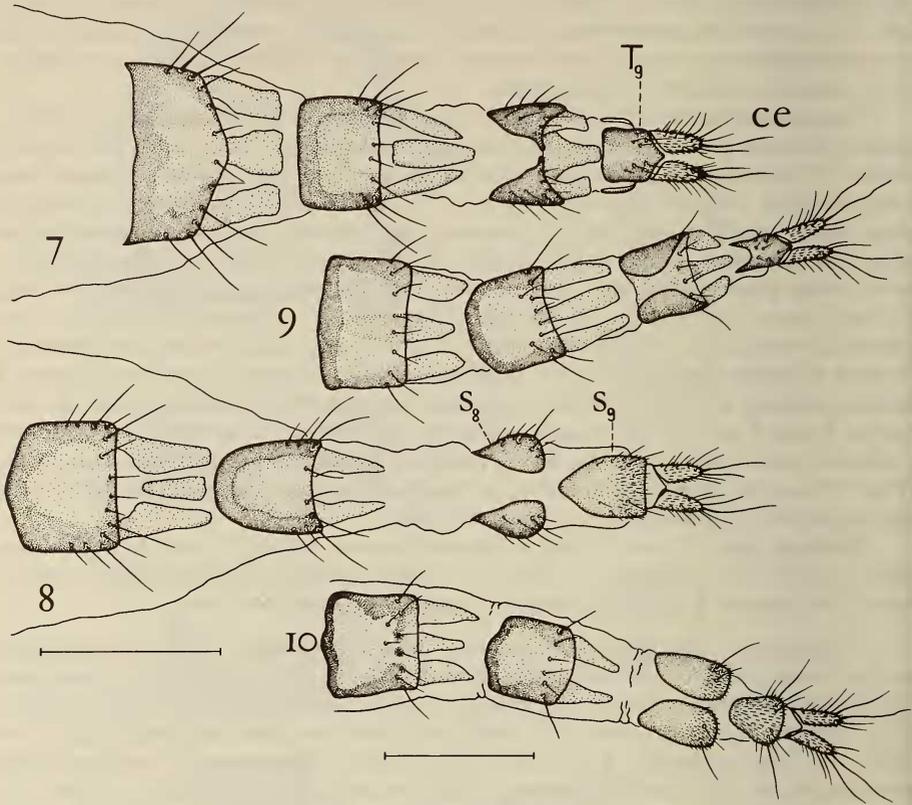
Holotype male: France, Alpes de Haute-Provence, Mélan, Grotte de St. Vincent, AHP 19, 13.IV.1977, leg. John D. Bourne. — Paratype female: data same as for the holotype. The types are preserved in alcohol (Geneva Museum).

Discussion. *Copromyza* (*Crumomyia*) *glacialis* (Meigen, 1830) was described on the base of a single male originating from the Mount Blanc, France. This male holotype has recently been revised by Mr. Allen L. Norrbom who found that the true *C. glacialis* is different from the species for which this name was used previously (e.g. DUDA 1923, 1938, HACKMAN 1965, ROHÁČEK 1976).* Thanks to figures and information kindly provided by Mr. Norrbom we recognized that our new taxon from the St. Vincent cave is very similar to the true *C. glacialis*, particularly as regards its male genitalia. However, it differs by some external features evolved in connection with its cavernicolous life-habits, viz. the reduced eyes, shortened wings, prolonged legs, reduced abdominal sclerites, etc. In addition, there are slight differences also in the extent of pruinosity on mesopleuron and in the shape of telomere. Nevertheless, the high resemblance of the male genitalia (including the aedeagal complex) demonstrates conspecificity of both taxa; therefore the cavernicolous population from the St. Vincent cave is considered only as a new subspecies, although it has been clearly (and apparently since long) reproductively isolated from its mountain relative.

C. glacialis gallica ssp. n. has probably evolved in similar way as did *C. parentela parentela* and *C. parentela cavernicola* spp. n. discussed below; thus, from the ancestral form of *C. glacialis* which had originally been a strictly psychrophilous but non-caver-

* *C. glacialis*: DUDA, 1923, etc. will be described as a new species later in the frame of a thorough revision of the subgenus *Crumomyia* Macquart prepared by A. L. Norrbom.

nicolous species, widely distributed in Central Europe during the Pleistocene Ice Ages. That stenoec species had been unable to tolerate great changes in climate of warmer and drier interglacial and/or postglacial periods and it had to retreat into habitats with corresponding microclimatic conditions, such as high mountains and caves (cf. PAPP



FIGS. 7-10.

Female postabdomens. Figs. 7-8. *C. (Crumomyia) glacialis gallica* ssp. n. paratype female; 7: dorsal view; 8: ventral view; Figs. 9-10. *C. (Crumomyia) parentela cavernicola* ssp. n. paratype female; 9: dorsal view; 10: ventral view. Abbreviations: ce: cerci, S_8 , S_9 : sterna, T_9 : tergum 9. Scales = 0.5 mm.

1982). While the mountain populations had not been obliged to change their life-habits essentially and they are now represented by *C. gracialis glacialis*, the populations restricted to caves had to adapt to the extreme conditions of cave habitat (complete darkness, etc.), that strongly reflected also on its morphology. In all probability the majority of cave-dwelling populations of *C. glacialis* had been extinct; the relic ones that survive up to the present should all be considered as different cavernicolous subspecies of *C. glacialis*. One of such populations had been detected in the St. Vincent cave and it was described above as *C. glacialis gallica* ssp. n.

Copromyza (Crumomyia) parentela cavernicola ssp. n.
(Figs. 9-10, 11-14)

Measurements in mm: body length 5.00 (holotype), 4.55 (paratype ♂), 3.86 (paratype ♀ without head); wings 3.73×1.60 (holotype), 2.80×1.06 (paratype ♂); length of thorax 1.26 (paratype ♂), 1.34 (paratype ♀); length of hind femur: tibia: tarsi = 2.20: 1.97: 1.63 (holotype), 1.77: 1.43: 1.43 (paratype ♂), 2.32: 1.89: 1.59 (paratype ♀); length and width of mt_3 : 0.34×0.17 , 0.285×0.145 ; sternites of male paratype: S2 0.26×0.34 , S3 0.40×0.40 , S4 0.37×0.40 , S5 0.17 (in sagittal line), 0.26 (laterally) $\times 0.46$; sternites of female paratype: S2 0.27×0.43 , S3 0.47×0.39 , S4 0.51×0.36 , S5 0.57×0.37 ; female tergites: T1+2 0.49×1.26 , T3 0.51×1.26 , T4 0.51×1.14 , T5 0.57×0.87 ; width of female abdomen 1.57.

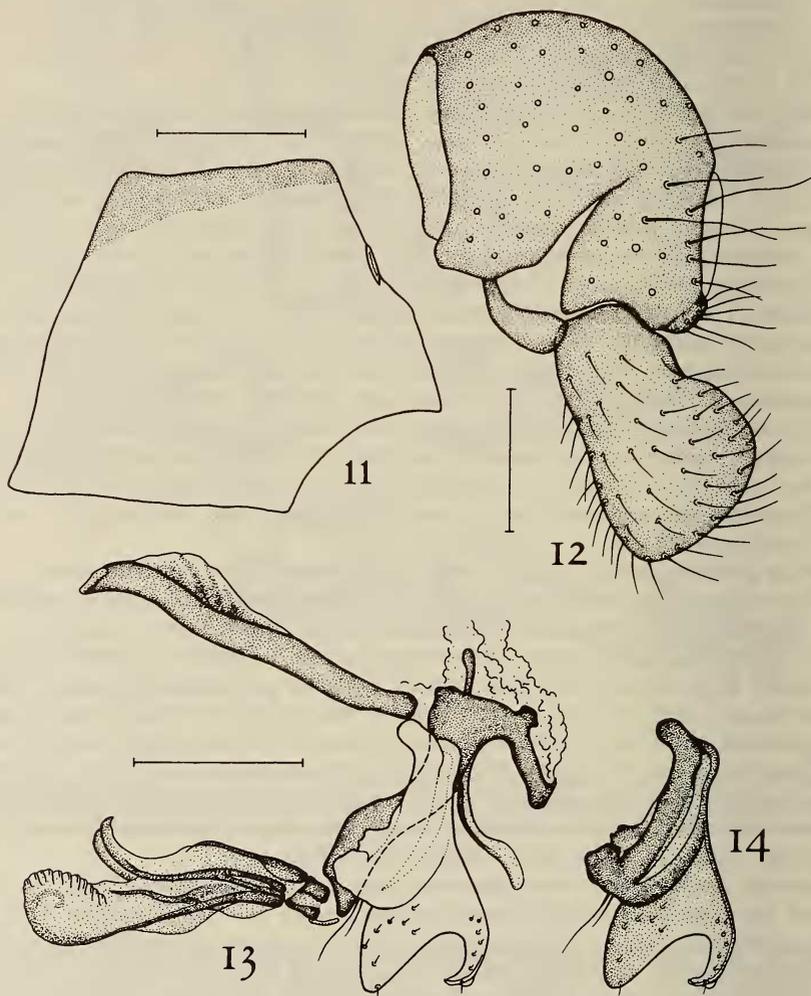
Body and legs all black, shining. Head comparatively small, as high as long (0.54 mm in paratype male); length of eye 0.275 mm, width of eye 0.202 mm, smallest genal width 0.225 mm, i.e. eyes much reduced; length of arista 1.20 mm (paratype male) with sparse, 0.045-0.055 mm long cilia. Orbitals rather long, anterior ors 0.30 mm on holotype, 0.24 mm on paratype male, posterior ors 0.33 mm on holotype, 0.24 mm on paratype male; vibrissae 0.42 mm (paratype). Palpi dark brown. Thorax with 2 rows of moderately long acrostichals (4 in-front of suture) and with 1 + 2 dc pairs (chaetotaxy as in its congeners). Thoracic stigmatae very small, slot-like (Fig. 11). Legs all black except for ventral side of tarsi (dark brown). Bristles on legs short, positions as in the other species in this species-group. Hind tibia with a short and thin anteroventral at its 3/5. Margin of scutellum without short bristles. Wings light brownish, costal vein and veins near anterior crossvein brown, other veins light brown; anterior crossvein with a small diffuse brown spot; medial section between crossveins 0.81 (paratype male), distal section 0.67 mm, posterior crossvein 0.22 mm; discal cell with a minute (0.02 mm) vein appendage. Fore and hind metatarsi with a ventroapical hook each. Halteres light ochreous with some brownish hue.

Male genitalia highly similar to those of *C. parentela alpicola*. Periandrium (Fig. 12) with distinct lateral slot between the original 8th sternum and epandrium (= periandrium *sensu* GRIFFITHS 1972). Surface of periandrium rather densely haired. Telomere (= surstylus) large, long, spoon-shaped and resembling that of *alpicola* in shape (cf. Fig. 12 of TROGER & ROHÁČEK 1980). Also internal genitalia i.e. aedeagal complex (Fig. 13) not particularly different from those of *alpicola*. Phallopore very long, sinuate, bearing pre-epiphallus as well as epiphallus. The latter structure carries a basal tubercle-shaped projection not found in *alpicola*. Distiphallus of the same structure as in *alpicola* but postgenite (Fig. 14) although very similar in appearance has simple ventral margin between apical lobes (slightly expanded in *alpicola*). Ejaculatory apodeme small, rod-like, partly hidden in the posterior opening of phallopore.

Female postabdomen much narrower than preabdomen, telescopically retractile. 6th and 7th terga and sterna pigmented only at anterior and lateral margins. Secondary tongue-shaped sclerotizations of membrane (for attachment of muscles for retraction of the postabdomen) developed behind terga 6-8 and sterna 6-7, usually 3 in number but in 7th sternum only 2 present. 8th tergum divided (or at least with bipartite pigmentation) into 2 plates. 9th tergum long, narrow, anteriorly with deep incision and carrying more sinuate hairs. 8th sternum (Fig. 10) distinctly divided into 2 sclerites and finely pubescent at posterior margin. 9th sternum small, rounded, subtriangular, pubescent and haired on posterior margin. Cerci long, slender (Fig. 9) with 2 long sinuate and some more shorter thin hairs. Spermathecae not studied (lost).

Holotype male: France, Alpes de Haute-Provence, Mélan, grotte de St. Vincent, July 12, 1978, leg. John D. Bourne; paratypes: 1 ♂, 1 ♀: *ibid.*, 13.IV.1977, AHP 18, leg. John D. Bourne.

The holotype was pinned on minutia-pin from alcohol, the paratypes are preserved in alcohol. The holotype and the female paratype are deposited in the collection of the Muséum d'Histoire naturelle Genève, the male paratype is in the collection of the Hungarian Natural History Museum.



FIGS. 11-14.

Copromyza (Crumomyia) parentela cavernicola ssp. n., paratype male. 11: mesopleuron (pruinose area dotted); 12: genitalia without aedeagal complex and hypandrium, lateral view; 13: aedeagal complex laterally (right postgonite omitted); 14: postgonite. Scales = 0.2 mm.

Discussion. This subspecies is — like *C. parentela parentela* (Séguy, 1963) — a clearly cavernicolous taxon. *C. parentela* was described from Špela Maja Hajne cave in Yugoslavia by SÉGUY (1963, as *Speomyia*). Mr. A. L. Norrbom has revised the type-series of this species and found it conspecific with *C. alpicola* Roháček in TROGER & ROHÁČEK 1980.* Indeed, both these taxa are highly similar to each other, including the male genitalia, but they differ in some external features (size of eyes, length of legs and arista, etc.). For that reason the latter taxon is reduced here to a subspecies: *Copromyza* (*Crumomyia*) *parentela alpicola* Roháček, 1980, **stat. n.** This subspecies is apparently restricted to high altitude habitats in Alps (besides the Obergurgl area it was recently found also in Hohe Tauern Mts.) and is probably very little different from the ancestral form of *C. parentela* that had certainly been a widespread species during Quaternary glacial periods, reaching at least South Yugoslavia. After warming up of the climate during interglacial and/or postglacial periods this distribution has become very disjunct islet-like, formed by mountain populations on the one hand and by the cave-dwelling populations on the other. The latter populations evolved probably into more different subspecies characterized by some morphological and physiological adaptations to cave habitats, of which two have been known till now, viz. *C. parentela parentela* from Špela Maja Hajne cave (Yugoslavia) and *C. p. cavernicola* ssp. n. from St. Vincent cave (France). Although both these cavernicolous subspecies display close similarity in outer appearance they are to be considered different taxa on subspecific level because of their long lasting isolation not mentioning slight differences in the formation of the male genitalia and pruinosity of the mesopleuron.

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* *C. parentela* (Séguy, 1963) will be redescribed in detail by A. L. Norrbom in his revision of the subgenus *Crumomyia* (in preparation).

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